

CLAIMS

1. Process for irradiating products by means of high energy X-ray beam source (1) in an installation
5 having an irradiation chamber (2), said process comprising the following steps, controlled by controlling means:

- determining the density of the products to be irradiated,
- in order to irradiate said products as a stack
10 predetermining, on the basis of said density, the optimal size of the product stack able to optimize the throughput of the installation and/or the dose uniformity ratio (DUR),
- in the irradiation chamber (2), loading products as a
15 stack onto rotation means (3) located in front of the X-ray beam source (1),
- while rotating the rotation means around a rotation axis (10), irradiating said products from a lateral side of said product stack.

20 2. The process according to claim 1, characterized in that the rotation speed of the rotation means in front of the radiation beam source is maintained constant.

25 3. The process according to claim 2, characterized in that the rotation speed of the rotation means in front of the radiation beam source is maintained constant by the action of the controlling means at a value depending upon predefined parameters.

30 4. The process according to any one of the preceding claims, adapted for irradiating products carried on pallets, characterized in that the stack is formed by at least two contiguous pallets (4', 4'').

5. The process according to claim 4, characterized in that the stack comprises at least four product pallets ($4'$, $4''$, $4'''$, 4^{IV}).

6. The process according to the preceding
5 claims, characterized in that in the stack the pallets are in a plane perpendicular to the rotation axis of the rotation means.

7. The process according to any one of claims claim 5 or 6, characterized in that in the stack four of
10 the product pallets ($4'$, $4''$, $4'''$, 4^{IV}) to be irradiated are rectangular product pallets and form together a square base with an open column (6) at the centre of the square base.

8. The process according to claim 7,
15 characterized in that in the stack the centre of the square (9) coincides with the rotation axis (10) of the rotation means.

9. The process according to claim 5 or 6, characterized in that in the stack four of the product
20 pallets to be irradiated are rectangular pallets having each at least one corner ($7'$, $7''$, $7'''$, 7^{IV}), and said four product pallets are arranged in such a way that said corner of each pallet coincides in a contact point (8) with one corner of the other three pallets.

25 10. The process according to claim 9, characterized in that in the stack the contact point (8) is located on the rotation axis (10) of the rotation means (3).

11. The process according to claim 1, adapted
30 for irradiating products under bulk form or under the form of small parcels, characterized in that the product stack is maintained in at least one cylindrical container (11) having an internal volume.

12. The process according to claim 11, characterized in that said products are arranged in said cylindrical container (11) so as to fill the total internal volume of said cylindrical container (11).

5 13. The process according to claim 11, characterized in that said products are arranged in said cylindrical container (11) so as to let an open column along the center axis of the cylindrical container (11).

10 14. The process according to claim 11, characterized in that said cylindrical container (11) is selected from a set of cylindrical containers such as tons or cylindrical baskets, having a diameter near to said determined optimal size.

15 15. The process according to any one of the preceding claims, characterized in that the irradiation of the products is performed by batches of products of similar densities.

16. Apparatus for irradiating products, said apparatus comprising:

- 20 - a high energy X-ray beam source (1), for irradiating the products from a lateral side with a beam directed along a first direction substantially perpendicular to said lateral side, and scanned along a second direction substantially perpendicular to said first direction,
- 25 - an irradiation chamber (2), where irradiation of the products can be performed, said irradiation chamber comprising rotation means (3) for rotating said products around a rotation axis (10) parallel to said second direction,
- 30 - rotation means for rotating said products in front of said X-ray beam source (1) at a constant rotation speed, around said rotation axis, during irradiation, said

rotation means comprising means for receiving the products;

said apparatus being characterized in that said means for receiving the products are adapted to receive products
5 loaded thereon as a stack the size of which is variable depending on the density of said products.

17. The apparatus according to claim 16, adapted to receive a product stack comprising products carried on pallets.

10 18. The apparatus according to claim 17, wherein the rotations means are adapted to receive a product stack comprising at least two contiguous pallets (4', 4'').

19. The apparatus according to claim 17,
15 wherein the rotation means are adapted to receive a product stack comprising at least four product pallets (4', 4'', 4''', 4^{IV}).

20. The apparatus according to any one of claims 16 to 19, wherein the rotation means are adapted to
20 receive a product stack wherein said product pallets are arranged relatively to each other in the same plane perpendicular to the rotation axis of the rotation means.

21. The apparatus according to claim 19 or 20, characterized in that the rotation means are adapted to
25 receive a stack wherein four of the product pallets (4', 4'', 4''', 4^{IV}) to be irradiated are rectangular product pallets and form together a square base with an open column (6) at the centre of the square base.

22. The apparatus according to claim 21,
30 characterized in that the rotation means are adapted to receive a stack wherein the centre of the square (9) coincides with the rotation axis (10) of the rotation means.

23. The apparatus according to claims 19, characterized in that the rotation means are adapted to receive a stack wherein four of the product pallets to be irradiated are rectangular pallets having each at least one
5 corner ($7', 7'', 7''', 7^{IV}$), and said four product pallets are arranged in such a way that said corner of each pallet coincides in a contact point (8) with one corner of the other three pallets.

24. The apparatus according to claim 23,
10 characterized in that the rotation means are adapted to receive a stack wherein the contact point (8) is located on the rotation axis (10) of the rotation means (3).

25. The apparatus according to claim 16, characterized in that the rotation means are adapted to
15 receive a product stack wherein the products are under bulk form or under the form of small parcels.

26. The apparatus according to claim 26, characterized in that the rotation means are adapted to receive a product stack wherein the product stack is
20 maintained in at least one cylindrical container (11) such as a ton or a cylindrical basket.

27. The apparatus according to any one of claims 16 to 26, characterized in that the means in the rotation means for receiving the product stack comprise a
25 turntable.

28. The apparatus according to any one of claims 16 to 27, characterized in that it further comprises controlling means for controlling the overall operating state of the apparatus.

29. The apparatus according to claim 28,
30 characterized in that said controlling means are able to control the rotation speed of the rotation means.

30. The apparatus according to claim 29, characterized in that said controlling means are able to

maintain constant the rotation speed of the rotation means, the value of said rotation speed being dependent upon predefined parameters.

31. The apparatus according to any one of
5 claims 16 to 30, it can operate for irradiation of the products by batches of products of similar densities.